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Commentary: Second-hand smoke and other potential lung cancer exposures among non-smoking women

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ABSTRACT:
Lung cancer among non-smoking individuals is mostly associated with the second-hand smoke (SHS) exposure. Other risk factors or exposures include air-pollution, radon, asbestos, certain heavy metals and chemicals. Furthermore, family history of lung cancer among blood relatives could also be associated with this cancer. The SHS exposure increases the risk of lung cancer in a dose-response manner among non-smokers. There is a need for enhanced surveillance and research to study the relatively less prominent risk factors of lung cancer among non-smoking females from diverse demographic and geographical backgrounds. The early screening of non-smoking household members of smokers could play an important role in future control and prognosis of lung cancer.

Key words: Lung cancer; secondhand smoke; exposure; nonsmoking households

INTRODUCTION

Lung cancer is one of the most commonly occurring neoplasms and considered as a leading cause of cancer related mortality. The lung cancer incidence has found to be declined about 32% among men in past few decades; however, an increase of 94% is observed among women during same time period [1].

In 2012, around 1.8 million people were diagnosed with lung cancer, meaning it accounts for 13% of all cancer cases reported globally. Furthermore, it was also associated with 19% of all cancer-related deaths [2]. In the same year, lung cancer was rated the third most common cancer among women after breast and colorectal cancers, in contrast to the first common cancer among men [3]. About 85% of lung cancer cases and 90% of associated deaths are linked to cigarette smoke, making it one of leading causes of morbidity, mortality, and financial burden among the patients [4,5].

Lung cancer among non-smokers is usually associated with exposure to second-hand smoke (SHS); however, other risk factors include exposure to radon, asbestos, heavy metals, chemicals, and air pollution.

Furthermore, a family history of lung cancer, especially among immediate blood relative is also a contributing factor [5,6]. Smoke from the burning tobacco products and/or exhaled by smokers both considered as a potential exposure and since 1964 have been associated with over 2.5 million deaths in United States alone [1,2].

The present commentary describes the findings from selected papers and examines the effect of SHS and other less recognized factors in the development of lung cancer among non-smoking women. Furthermore, it also emphasizes on the dose-response effect of SHS in lung cancer development.

EXPOSURES AMONG NON-SMOKING WOMEN

A recently published article based on the UK million women study shows that the lung cancer incident was significantly higher among nonsmoking women of non-white ethnicity (RR=2.34, CI=1.55-3.52, P<0.001), taller stature (RR=1.16, CI=1.03-1.32, P=0.02) and who were taking treatment for asthma (RR=1.32, CI=1.10-1.58, P=0.003) [7]. This study was a large prospective cohort in which 1.2 million women in the UK without a prior history of cancer were followed up. In the sample, 51% stated that they had never smoked and after 3 years follow-up 0.2% of them (1469/634065) developed lung cancer. No significant association was found with other tested factors such as family history of cancer among parent(s), oral contraceptive use, physical activity, dietary habits and interestingly SHS

exposure during child and/or adulthood etc. The limitation of this study was that it didn't examine the effect of radon, indoor/outdoor pollution and occupational exposures among participants.

A study conducted in Taiwan describes the cumulative effect of SHS exposure in development of lung cancer among nonsmoking women during child and adulthood [8]. In this age-matched case-control study, one case was matched with two controls leading to a total of 268 cases and 445 controls who were interviewed while seeking medical care at one selected university hospital. Childhood and adult life exposures at home increased the risks of lung cancer to 2.1 (CI=1.4-3.1) and 2.0 (CI=1.4-2.8) folds respectively among non-smoking women. Adjusted for various factors, SHS exposure during childhood measured as smoker-year significantly increased the risk of lung cancer (OR=1.8, CI=1.2-2.9) when smoker-years were >20. Similarly, for adult life exposure of smoker-years >40 increased the cancer risk to 2.2 folds (CI=1.4-3.7). For lifetime exposure of smoker-years >60 increased the odds of developing lungs cancer 2.8 folds. In all life stages, a dose-response relationship was observed between the smoker-years and odds of developing cancer (P-trend for all three life stages was <0.05 separately).

Similar findings were seen in a Chinese study in which exposure from a spouse (OR=1.1, CI=0.8-1.5) or at work (OR=1.7, CI=1.3-2.3) both increased the odds of developing lung cancer among the sample [9]. The study included 504 cases identified from the cancer registry and 601 controls from the residential registry in Shanghai. SHS exposure at work and home together significantly increased the odds of having lung cancer to about two folds (OR=1.9, CI=1.1-3.5) during adulthood. Furthermore, the number of hours per day exposure (P-trend <0.001) and the number of co-workers who smoked (P-trend <0.001) had a dose-response relationship in the causation of all types of lung cancer. In addition, the family history of lung cancer (OR=2.7, CI=1.5-4.7), high-risk occupations (OR=1.5, CI=1.1-2.1), exposure to the slight (OR=1.5, CI=1.1-1.9) and considerable (OR=2.3, CI=1.6-3.3) kitchen smoke increased the odds of developing lung cancer among non-smoking females.

In an American study with a relatively larger case-control sample, it was found that there was an excess 30% risk of lung CA among spouses of Tobacco users increasing to 80% excess risk among the sample with 80 or more pack-years of exposure from a spouse [10]. This was a multicenter population-based study executed in five metropolitan areas in the United States. The cases (n=653) were selected from the hospitals in the areas and 1253 controls were enrolled by using random digit dialing method. SHS exposure from all types of tobacco (from spouse) increased the odds of developing all types of lung cancers among non-smoking women (OR=1.29, CI=1.04-1.60). A dose-response trend between pack-years exposure and all lung cancers (P-trend=0.03) and adenocarcinoma (P-trend=0.05) was observed among the sample. Smoke per year exposure also showed a similar pattern (P-trend=0.0001). Childhood exposure and childhood smoke-years of exposure didn't show a significant risk of lung cancer among non-smoking women.

CONCLUSION

A review of these studies reveals that SHS exposure is a serious public health problem contributing to high prevalence of lung cancer around the world. The results showed that almost all levels of SHS exposure, in terms of duration and amount, significantly contribute to the rising incidence of lung cancer. Even though SHS exposure is considered one of the prominent contributory factors for lung cancer, we cannot ignore the impact of other elements that predispose one to cancer with or without SHS. For example, a few relatively less explored factors, e.g. indoor house pollution due to coal use, have been identified to increase the risk of lung cancer in a poorly ventilated environment [11]. Also, in another study, the lung cancer risk was identified to be higher among non-smoking women who were residing near industrial areas with a significant dose-response relationship [12]. This point highlights the need to further expand programs and studies to include research on non-tobacco-associated factors that could lead to lung cancer development among non-smokers, especially females who may have unique exposures, for example, owing to their occupational and/or household practices. Furthermore, the studies reviewed are from South East Asia and the Western

world, so it would be interesting to see the results from other regions of the world that experience unique and diverse socio-economic circumstances. The inclusion of early screening for lung cancer among non-smoking household members of smokers could play a critical role in overall early detection and management of lung cancer cases. Surveillance approaches to assess the worksite exposures could also be beneficial as an additional part of program implementation [13].

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